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NOTIFICATION OF ELECTION

(PCT Rule 61.2)

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United States Patent and Trademark Office, PCT
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Applicant ZENGA, Giovanni, Battista	

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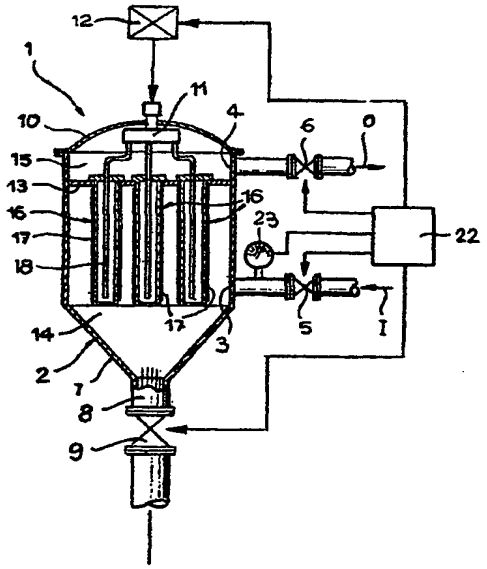
(54) Title: LAMINAR STRUCTURE



(57) Abstract: A laminar structure (17) comprising a deposited metal, the structure having microholes (17a) extending between a first surface and a second surface thereof, each microhole having a wall which meets the first surface with a rounded edge or tapered configuration in such a manner that the first surface is substantially smooth.

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LAMINAR STRUCTURE

This invention relates to laminar structures. Preferred embodiments relate to laminar structures as filter elements, laminar structures as heat sinks, and laminar structures as medical devices.

As mentioned above, one embodiment of the present invention is concerned with filtering devices in general and, more particularly a filtering element for treating liquids, dusts and also gases. This aspect of the invention is useful for filtering liquids that contain material to be removed (for example lubricating and/or cooling liquids employed in mechanical processing), for filtering dusts in environments in general (especially industrial environments, such as steel works for example), and for processing exhaust gases from internal combustion engines of motor vehicles and, more particularly, oxidizing anhydrides present in these gases.

It would be desirable if the filtering element described above could be readily cleaned from time to time, should this prove necessary, thereby avoiding difficulties associated with clogging which might otherwise require the element to be replaced.

Another embodiment of the invention is concerned generally with heat sinks by means of which heat may be dissipated from machinery and the like. In such situations, it is advantageous for air, for example, to be able to flow cleanly through the heat sink with reduced disruption.

Another embodiment of the invention is concerned generally with medical devices, and in particular with orthopedic or orthodontic devices where it is preferred that the body of the patient, and in particular the bones of the patient, can bond with and secure the device in place.

In a first aspect, the invention provides a laminar structure comprising a deposited metal, the structure having microholes extending between a first surface and a second surface thereof, each microhole having a wall which meets the first surface with a rounded edge or tapered configuration in such a manner that the first surface is substantially smooth.

Other preferred features are set out in the appended claims.

In a preferred form, the laminar structure when used as a filtering element comprises a tubular and generally cylindrical body with a perforated wall intended to be crossed by a fluid to be filtered, essentially characterized in that the said wall presents a layer-like structure obtained by means of a controlled galvanic electroforming process with selective deposition of nickel on a matrix arranged at the cathode, the said layer-like structure having an outer surface which is smooth and devoid of roughness and being formed with micro-holes that have walls with rounded edges and diameters depending on the length of time in the galvanic bath and the desired-thickness of the laminar structure, preferably smaller than 30 micron.

When used for the filtering of liquids, the filtering element in accordance with the invention can be advantageously applied, possibly together with several other similar filtering elements, to constitute a self-cleansing filtering device.

Aspects of the invention will now be described by way of example only and with reference to the accompanying drawings, in which:

Figure 1 is a schematic view of a filtration system which incorporates a laminar structure as a filter element;

Figure 2 is a schematic view of a portion of the laminar structure during its production process;

Figure 3 is a schematic plan view in the direction of the arrow III of Figure 2.

Figure 4 is a schematic view of the laminar structure as a medical device; and

Figure 5 is a schematic view of the laminar structure as another type of medical device; and

Figure 6 is a schematic view of the laminar structure as a heat sink.

Figure 1 shows a filtering device 1 interposed between an inlet line I of a liquid to be filtered (for example, a cooling emulsion of oil and water used during the carrying out of a machining operation and which may contain shavings and other particles of material to be removed) and an outlet line O that the liquid, when filtered and cleansed of at least some of the particles it contained, crosses in order to be re-inserted in the cooling circuit.

The filtering device 1 comprises a closed shell 2 (which is normally metallic) that is provided with an inlet opening 3 in communication with the inlet line I and an outlet opening 4 in communication with the outlet line O.

The inlet opening 3 and the outlet opening 4 are associated with, respectively, the valves (which may be electrically operated valves for example) indicated schematically by the reference numbers 5 and 6, which make it possible for the openings 3 and 4 to be selectively opened and closed.

The shell 2, which is preferably of a circular cross-section, has a lower portion 7 in the form of a funnel that converges onto a lower discharge opening 8 that is likewise controlled by a valve 9 (which may also be an electric valve).

The upper part of the shell 2 is closed by a selectively removable lid 10 on which there is mounted a pneumatic distribution device 11 that can be supplied with pressurized air or other fluid gas from a source 12.

Reference number 13 indicates a flange that extends transversely inside the shell 2 and in contact with its upper extremity. The flange 13 divides the volume within the shell 2 into a first chamber 14 which corresponds roughly to the middle and lower portion of the shell 2, and a second chamber 15 that corresponds roughly to the upper portion of the shell 2.

The first chamber 14 communicates with the inlet opening 3, while the second chamber 15 communicates with the outlet opening 4.

The flange 13 which acts as a partition baffle within the shell 2 carries a plurality of filtering members 16, each of which comprises an elongate support in the form of a hollow, and therefore permeable, cylinder; one end, preferably the upper end, of which is connected in a watertight manner to the flange 13. The other, preferably the lower end, is closed and arranged as to be generally coincident with the lower funnel portion 7 of the shell. Within the first chamber 15 each of the filtering members 16 therefore extends downwards from the flange 13. The internal cavity of each of the said filtering members 16 communicates with the second chamber 15.

It will be understood, of course, that the positional phrases "upper", "lower" and "downwards" relate solely to the orientation shown in Figure 1 and therefore should not be taken as implying any other positional or orientational limitation.

Each of the filtering members 16 is surrounded by an external filtering element 17 (the laminar structure) that consists of a thin and flexible cylindrical sheath, which may also be slightly conical, and which is open at both ends (although it could be open at just one end).

As can be seen more readily in Figures 2 and 3, each filtering element 17 has a micro-perforated laminar or layer-like structure and is therefore porous, where the perforations, indicated by 17a, have a plan (or section) form (i.e. have a shape when in plan view) that may be polygonal, generally hexagonal, or rhomboidal and walls that have rounded surfaces and taper from the outer face of the layer towards the inner face. More generally, the micro-holes 17a may have a form that simply converges or simply diverges from the outer face to the inner face of the layer and may also be of a converging-diverging form. The said micro-holes 17a may have diameters depending on the length of time in the galvanic bath and the desired thickness of the structure. One has to do with dimensions that will normally be less than 60 microns, preferably less than 30 microns, and could be, for example, of the order of 3 - 4 microns. These diameter sizes may either be homogeneous or differ from one region to another, in accordance with appropriate optimization criteria.

It is, of course, possible to use filtering elements 17 in which the hole sizes have to be adapted to specific application requirements and are therefore different from the ones indicated hereinabove.

In general, the density of the micro-holes 17a may be comprised, for example, between 10 dots/mm and 2 dots/mm (i.e. 10 holes/mm and 2 holes/mm), while the thickness of the laminar structure may be of the order of 80 microns to 500 microns. The micro-perforated filtration lamina 17 is realized by means of a controlled galvanic electroforming process, with (in this embodiment)selective deposition of nickel on a matrix at the cathode, appropriately prepared for surface conditioning of the layer 17. In particular, the said matrix, generically indicated by the letter M, has a hollow imprint, sometimes referred to as an "inkpot", suitable for creating the conductive zones for the electroforming process and the zones rendered insulating by filling with dielectric resins that constitute the electroformed holes, and eventually leveled and chrome-plated. In this way the nickel formed on the matrix M during the electrogalvanization process becomes deposited in the surroundings of the imprints S, thus forming the micro-holes 17a. The surface of the layer 17 realized in this manner has its outer surface, i.e. the surface that during the formation process is turned towards the matrix perfectly smooth and devoid of all roughness.

Purely by way of example, in this embodiment the material employed for the depositing the nickel on the matrix at the cathode could have the following composition:

- nickel sulphate	300 g/l
- nickel chloride	28 g/l
- boric acid	50 g/l
- MAGNUM/RT (BL 251) additive	1 ml/l
- 1.3.6 naphthalenetrisulphonic acid trisodic salt	7 g/l

The operating conditions for the galvanization process, again purely by way of example, could be as follows:

- temperature:	52 – 56°C
- electrometric pH:	4.4 - 4.8
- cathode movement:	obligatorily rotational
- cathode rotation speed:	80 - 90 m/min
- filtration:	continuous, on activated carbon

As far as the number of the filtering members 16 and related filtering elements 17 in accordance with this embodiment of the invention is concerned, the choice will be made on the basis of the specific requirements of each particular application, since it is also possible, if appropriate, to use no more than a single filtering member 16.

Each filtering member 16 contains in a generally axial position a pneumatic duct 18 which is connected to a air distributor 11 and is provided with a series of air-blowing orifices arranged at different levels, each orifice being equipped with an appropriate valve not shown on the drawings. The Reference number 22 identifies an electronic unit that controls the functioning of the valves 5, 6 and 9, of the pressurised-air source 12 and a distributor 11 in such a manner as to produce an orderly sequence of filtering phases and cleaning phases of the device 1. In the embodiment here illustrated, switching between the two phases is controlled by the unit 22 as a function of the signal generated by a barometric sensor 23 that senses the fluid pressure gradient existing between the inlet opening 3 and the outlet opening 4, that is to say, the so-called loss of head of the fluid circuit through the filtering device 1.

During the filtering phase, the valve 9 is closed and the pressurized-air source 12 is deactivated. The valves 5 and 6, on the other hand, are maintained in their open

positions, so that the fluid to be filtered can penetrate into the interior of first chamber 14 and subsequently pass into the second chamber 15 by passing through the micro-holes 17a of the elements 17 of the filtering members 16. As a result of the previously described dimensions of these holes, at least a proportion of any solid material (for example shavings, dirt or slag in general) dragged along by the liquid will be held back on the outer surface of the filtering elements 17, while the filtered fluid will accumulate inside the chamber 15 and eventually leave the filtering device though the outlet opening 4 (it could of course be pumped from the outlet 4 to improve flow through the device). The outer surfaces of the filtering elements 17 thus act in the truest sense of the term as "accumulation surfaces" or as surfaces upon which material upon which removed from the fluid subjected to the filtering process is accumulated.

As will be appreciated, due to the gradual accumulation of material, the clear size of the holes 17a (i.e. the portion of the holes that is not obstructed by filtered material) of the filtering elements 17 tends to diminish, thus increasing the pressure gradient between the inlet opening 3 and the outlet opening 4. When this gradient attains some predetermined or user-selected value, the barometric sensor 23 sends a switching signal to the unit 22, which thereupon commands the commencement of the cleansing phase.

During this phase the valves 5 and 6 are closed to prevent liquid from passing through the filtering device 1.

The valve 9, on the other hand, is opened and the system 11, 12, 18 is activated. An air stream (or other gaseous or fluid stream) issuing from the orifices of the air ducts 18 impinges violently on the wall of the filtering members 16 and then of the filtering elements 17, thus detaching the material deposited on the outer surfaces of the latter; this material then drops into the first chamber 14 and eventually exits from the filtering device 1 through the discharge duct 8.

On completion of the cleansing operation (which is continued for a predetermined or user-selected interval of time) the unit 22 emits commands that causes the system to pass once again into the previously described filtering phase.

It should however be noted that whilst the invention has here been described with specific reference to a filtering device for lubricating and cooling liquids employed in machining operations, it can be applied in an equally advantageous

manner to a wide range of fluids, liquids and gases containing contaminating particles that have to be removed or, more generally, are to be treated. These fluids may include liquids of various kinds, air carrying atmospheric dust, and also the exhaust gases of internal combustion engines. In the latter case, however, the purification treatment of the gases does not solely consist of a filtration, but also of an oxidation of anhydrides present in the exhaust gases following the raising of their temperature during the passage through the micro-holes of the filtering element 17.

Of course, the filtering or - more generally - the treatment device that makes use of the filtering elements in accordance with the invention will have to be adapted to the particular requirements of these different applications (for example by adjusting the hole size or density), though in a generally conventional manner well within the capacity of a technician specialized in this area. It should also be noted that the cleansing system of the filtering device may likewise be different from the one here described and may be, for example, an ultrasonic system or, in the case of dusts, a simple shaking device. In the case of applications for the treatment of the exhaust gases of internal combustion engines, there is no need for a cleansing cycle, because the particulate matter retained by the filtering element in accordance with the invention will simply be released into the atmosphere for a spark ignition cycle and self-burnt in the case of a Diesel cycle.

As mentioned above, in the first embodiment of the invention the laminar structure is useful as a filter element. In a second embodiment of the invention, as will now be described with reference to Figures 4 and 5, the laminar structure of the invention may also be useful in medical devices. In these embodiments, it is preferred that the laminar structure comprises titanium.

Figure 4 is a schematic view of a prosthetic hip joint which is commonly used for replacement of hip joints that have degraded, for example as a result of osteoporosis.

The joint 30 comprises a leg portion 32 and a hip portion 34. The leg portion 32 comprises a spike 34 which is designed to be driven into the femur of a patient, and a peg 36 which is receivable in the hip portion and which is designed to act as a pivot point about which the patient's leg can move.

As shown , the spike 34 is formed at least partly of the laminar structure used in the first embodiment and may have similar features to those described above. The peg 36 (in contrast to the spike) is not formed of a laminar structure as hereinbefore described, but is instead solid and of a metal or alloy so that the peg generally has a greater mechanical strength than the spike.

The hip portion comprises a dish 38 which acts as a surface on which the peg can bear during movement of the spike (which naturally occurs as the leg in which the spike is inserted is moved), and is covered by a cap 40 which is formed of the above described laminar structure.

Advantageously, the holes in the laminar structure of the spike 34 and cap 40 are such that plasma, for example, can flow therethrough to allow bodily material, such as tissue or bone for example, to grow into the spike and the cap thereby securing the spike and cap in place.

Similarly, Figure 5 shows an orthodontic device which could be implanted in a patient who has experienced a broken jaw, for example, so that tissue or bone surrounding the device can grow into the device as the broken jaw mends. As will be appreciated, the device provides support whilst the broken bone is mending, and also acts as a means for strengthening the mended bone.

In addition to being used as an orthodontic device, it will be apparent that the laminar structure could also be used to overlie a break in a patients radius or ulna, for example, or any other bone. Effectively, the laminar structure acts to support the bone whilst healing and also acts as a means for strengthening the break after healing has occurred. The laminar structure could be secured to the bones either side of a break to stabilise the break and to assist the mending of the break that naturally occurs.

Figure 6 is an elevational view of a third embodiment of the invention, where the laminar structure 17 is used as a heat sink. In this embodiment, it is preferred that the laminar structure is of a good heat conductor such as nickel, titanium, silver, gold or brass.

As shown in Figure 6, the laminar structure is attached to a surface 50 which will be or is warm or hot. The surface 50 could, for example, be a housing for a piece of electronic equipment such as a microprocessor, or a housing for another mechanical and/or electrical device. The laminar structure serves to conduct heat away from the

surface 50, and the holes formed in the structure allow air to flow through the structure to further improve the heat dissipating effect of the structure.

It will be appreciated from the above that as the outer surface of the laminar structure is smooth and devoid of roughness and is formed with micro-holes that have walls with rounded edge, it is particularly well suited for use in medical devices since the likelihood of rough edges which could cause internal injuries is reduced. Furthermore, as the structure is substantially smooth it is easier to clean. The smooth nature of the structure is also advantageous when used as a heat sink since the smooth surface is less likely to resist air flow thereover and/or therethrough.

It will be apparent from the above, that one embodiment of the invention provides a laminated structure, manufactured to the desired form with perforated walls which can dissipate heat when machines operate at high temperatures is obtained by a galvanic electro-forming process with deposition of nickel or titanium or silver or gold or brass on a matrix (M) arranged at the cathode. It is designed superficially with micro-incisions until the desired micro-perforations are position where desired, at the diameter desired and at the thickness requested for a correctly calculated wall thickness.

Another embodiment of the invention provides a laminated structure, manufactured to the desired form with perforated walls which is designed to be used for the mending of bones for the medical sector in orthopedics and/or orthodontics is obtained by a galvanic electro-forming process with deposition of titanium on a matrix (M) arranged at the cathode. It is designed superficially with micro-incisions until the desired microperforations are positioned where desired, at the diameter desired which can be linked to the diameter of plasma cells to nourish the bone material being reconstructed.

In another arrangement, the laminar structure can be formed or constructed as a cage and secured at either end to a bone or parts of the same bone. As a result of the microholes in the structure, blood can flow therethrough to enable the bones to regenerate themselves.

Naturally, the construction details and the embodiments described above may be varied with respect to what has here been described and illustrated without

disserting from the spirit and the scope of the present: invention as set out in the claims that follow.

CLAIMS

1. A laminar structure comprising a deposited metal, the structure having microholes extending between a first surface and a second surface thereof, each microhole having a wall which meets the first surface with a rounded edge or tapered configuration in such a manner that the first surface is substantially smooth.

2. A structure according to Claim 1, wherein the microholes have a diameter of less than 30 μm.

3. A structure according to Claim 1 or 2, wherein the microholes have a diameter of less than 3-4 μm.

4. A structure according to any preceding claim, wherein the microholes have a polygonal or rhomboid form.

5. A medical device comprising, at least in part, a structure according to any preceding claim, the structure having microholes formed therein which are at least sufficiently large to permit the passage of plasma, for example, therethrough.

6. A medical device according to claim 5 in the form of a prosthetic hip joint, the hip joint having a leg portion comprising a spike and peg and a hip portion comprising a dish and a cap; wherein the spike and the cap comprise said laminar structure.

7. A medical device according to claim 5, wherein the laminar structure is formed as a cage, respective ends of the cage being securable either side of a break in a bone or to individual bones to promote regeneration of bone structure across said break or between said individual bones.

8. A medical device according to any preceding claim, wherein the structure is of titanium.

9. A heat sink comprising a structure according to any of claims 1 to 4, one end of said structure being capable of being affixed to a surface from which heat is to be conducted.

10. A heat sink according to claim 9, wherein the structure is of nickel, silver, gold, brass or titanium.

11. A filter element comprising a laminar structure according to any of claims 1 to 4 formed as a tube.

12. A filter element according to claim 11, wherein the laminar structure is of nickel.

13. A filter element according to claim 11 or 12, wherein the laminar structure is arranged to facilitate cleaning of the filter element.

14. A method of forming a laminar structure according to any of claims 1 to 4 comprising selectively depositing in a galvanic electroforming process a metal on a matrix arranged at the electroforming cathode to form said structure with a smooth surface formed with microholes meeting the first surface with a rounded or tapered configuration, the walls of said holes having rounded edges and diameters which formed in dependence upon the length of time the structure is placed in a galvanic bath used in said process and the desired thickness of the laminar structure.

15. A method according to claim 14, wherein the metal is nickel, gold, silver, brass or titanium.

Fig. 1

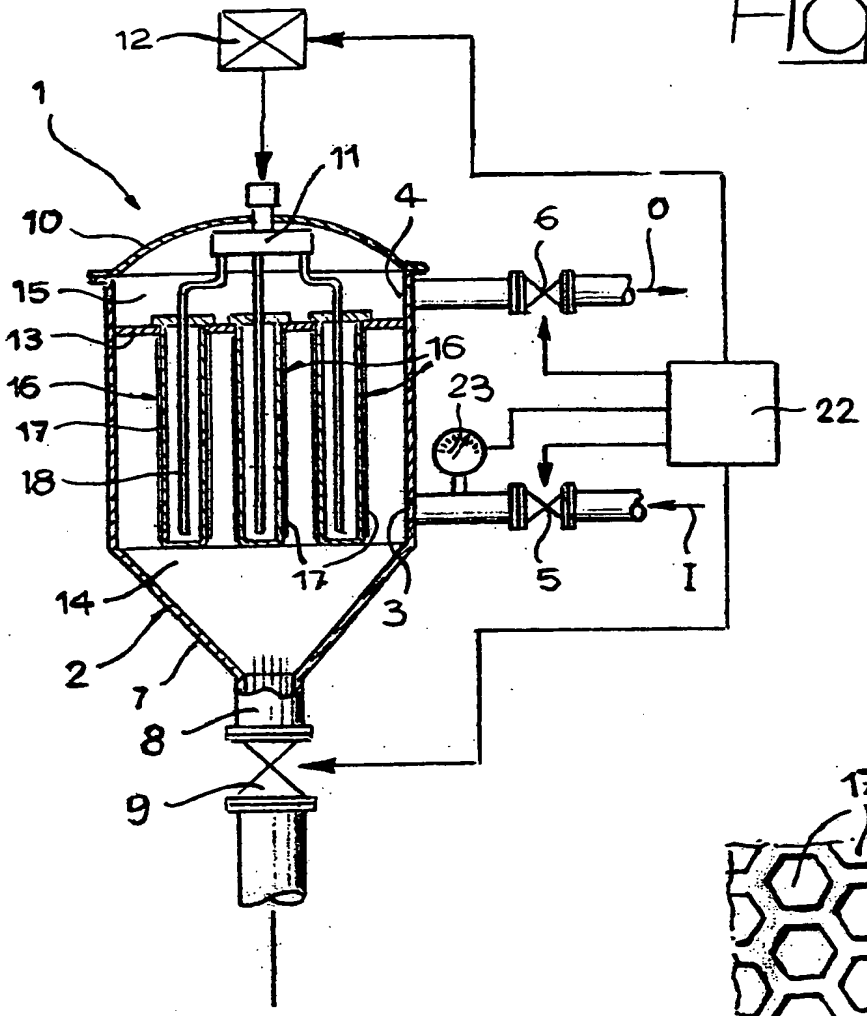


Fig. 3

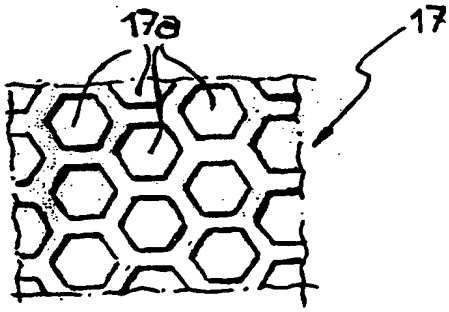
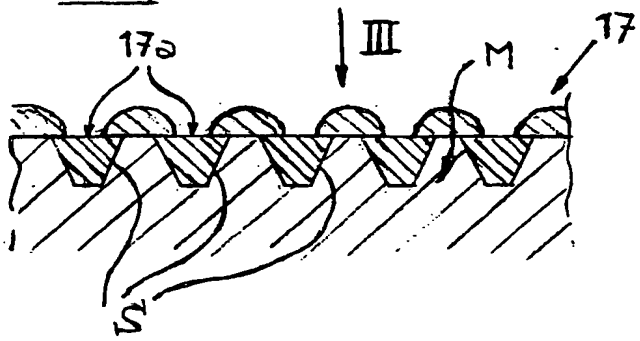


Fig. 2



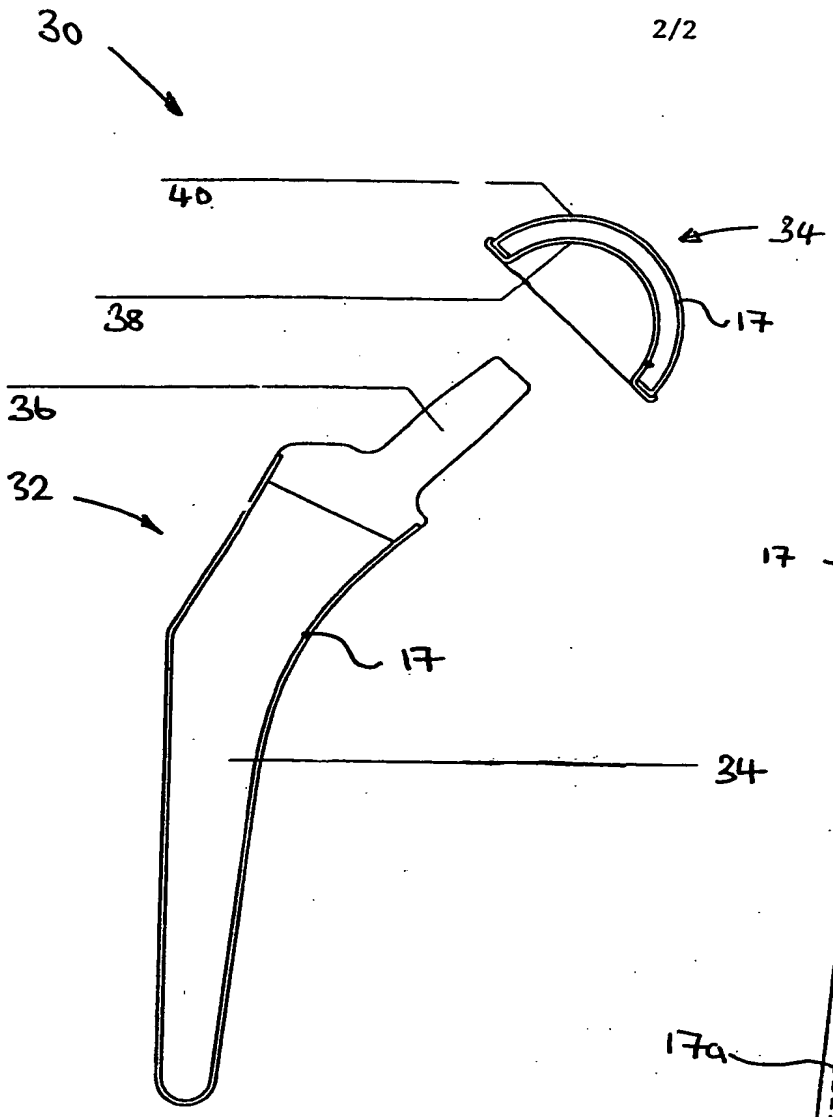


FIGURE 4

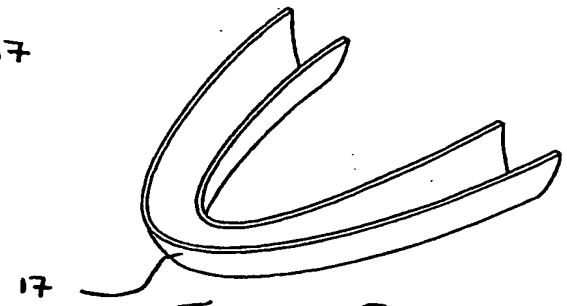


FIGURE 5

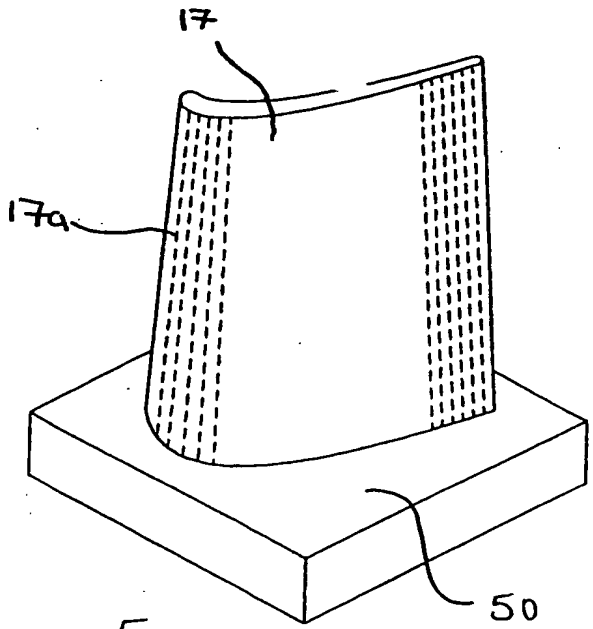


FIGURE 6

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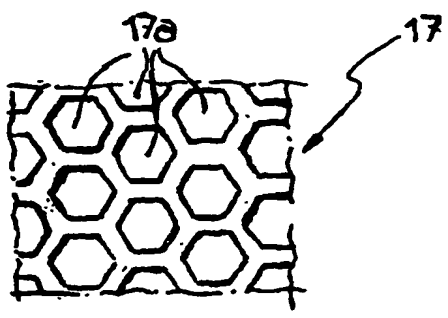

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B01D39/20 C25D1/08 C25D1/20 A61F2/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B01D C25D A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 4, no. 151, 23 October 1980 (1980-10-23) & JP 55 097220 A (DAINIPPON PRINTING CO), 24 July 1980 (1980-07-24) abstract	1-4,11, 13,14
X	US 4 118 288 A (S.RÜCKL) 3 October 1978 (1978-10-03) the whole document	1-4
A	US 4 839 001 A (J.J.BAKEWELL) 13 June 1989 (1989-06-13) the whole document	1,12,15
A	EP 0 621 018 A (KYOCERA CORP.) 26 October 1994 (1994-10-26) claims 1,4; figures 1-4	1,5-8

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 April 2001	18/04/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bertram, H

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Intern. ial Application No
PCT/IB 00/01419

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 1 215 864 A (BUCKBEE-MEARS COMP.) 16 December 1970 (1970-12-16) the whole document	1
A	US 4 552 832 A (F.BLUME ET AL.) 12 November 1985 (1985-11-12) claim 1; figures 1,8	1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/IB 00/01419

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 55097220 A	24-07-1980	JP 1439716 C	19-05-1988
		JP 62049094 B	16-10-1987
US 4118288 A	03-10-1978	AT 358072 B	25-08-1980
		AT 228376 A	15-01-1980
		AU 501755 B	28-06-1979
		AU 2371277 A	05-10-1978
		BE 852744 A	18-07-1977
		CA 1104869 A	14-07-1981
		CH 627794 A	29-01-1982
		CS 190343 B	31-05-1979
		DD 130013 A	01-03-1978
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		DK 138077 A,B,	30-09-1977
		ES 457221 A	16-06-1978
		FR 2346150 A	28-10-1977
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		HU 176024 B	28-11-1980
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		EP 0566427 A	20-10-1993
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		DE 69328047 T	13-07-2000
GB 1215864 A	16-12-1970	DE 1771771 A	05-01-1972
		NL 6816324 A,B	29-09-1969
US 4552832 A	12-11-1985	DE 3208081 A	08-09-1983
		AT 22710 T	15-10-1986
		DE 3366717 D	13-11-1986
		EP 0088476 A	14-09-1983
		JP 1396218 C	24-08-1987
		JP 58157985 A	20-09-1983
		JP 62005235 B	03-02-1987

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
P007708WONJN		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/IB00/01419	22/09/2000	22/09/1999
International Patent Classification (IPC) or national classification and IPC B01D39/00		
Applicant VIOSTYLE LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☒ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
19/04/2001	10.12.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Connor, M Telephone No. +49 89 2399 8402

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB00/01419

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1-10 as originally filed

Claims, No.:

1-15 as originally filed

Drawings, sheets:

1/2-2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

☐ restricted the claims.

☐ paid additional fees.

☐ paid additional fees under protest.

☒ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

☐ complied with.

☒ not complied with for the following reasons:
see separate sheet

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

☒ all parts.

☐ the parts relating to claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-8,11-15
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-15

Industrial applicability (IA) Yes: Claims 1-15
No: Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Re Item IV

Lack of unity of invention

1 As explained in point V-2&3 (below), the subject matter of claims 1 and 14 is not considered to be new in view of the prior art (Article 33(2) PCT). Consequently, there is no inventive concept linking the subject matter of claims 5, 9, and 11 (Rule 13 PCT).

The applicant is asked to state upon which invention further prosecution of this application should be based and to limit the application accordingly. Other inventions are to be excised from the claims, description and drawings.

Re Item V

Reasoned statement under Rule Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 The following documents are referred to in the present opinion:

D1: PATENT ABSTRACTS OF JAPAN vol. 4, no. 151, 23 October 1980 (1980-10-23) & JP 55 097220 A (DAINIPPON PRINTING CO), 24 July 1980 (1980-07-24)
D2: US-A-4 118 288 (S.RÜCKL) 3 October 1978 (1978-10-03)
D3: US-A-4 839 001 (J.J.BAKEWELL) 13 June 1989 (1989-06-13)
D4: EP-A-0 621 018 (KYOCERA CORP.) 26 October 1994 (1994-10-26)
D5: GB-A-1 215 864 (BUCKBEE-MEARS COMP.) 16 December 1970 (1970-12-16)

2 The method of producing a laminar structure proposed in claim 14 of the present application cannot be considered as being novel (Article 33(2) PCT) for the following reasons. D5 discloses the same method as the one called for in claim 1 of the present application (cf. in particular Figures 1 and 3).

3 The laminar structure proposed in claim 1 of the present application cannot be considered as being neither novel nor inventive (Article 33(2)&(3) PCT) for the following reasons.

3.1 D1-D3 disclose a laminar structure comprising a deposited metal with through-holes. It can be seen in Figure 11 of D2, that the edge of the holes of the metal grid #23 is slightly rounded. Said structure is considered to be common to the grids of all of D1-D3 since the grids disclosed therein are all obtained by the same type of process:

viz., galvanic deposition onto a metallic surface comprising a coated layer of a photosensitive material forming a dotted pattern.

3.2 D5 discloses a method of forming laminar structures falling within the scope of claim 14 of the present application (cf. point V-2 supra). Since the method called for in claim 14 has necessarily as its end result the product called for in claim 1 of the present application (Article 6 and Rule 13 PCT), the grid obtained with the process disclosed in D5 necessarily falls within the ambit of claim 1 of the present application.

4 The filter element proposed in claim 11 of the present application cannot be considered as being neither novel nor inventive (Article 33(2)&(3) PCT) because D1 discloses a similar filter.

5 The medical device proposed in claim 5 of the present application cannot be considered as being inventive (Article 33(3) PCT) because D4 discloses medical devices comprising a metal structure having micro holes formed therein. The skilled person would only have to chose between one of the grids available in the market (e.g., as disclosed in D1-D3 or D5) to reach the subject matter of claim 5 of the present application, without involving any inventive activity.

6 The search report does not comprise any document disclosing a heat sink. It is the opinion of the substantive examiner, however, that a heat sink comprising a grid structure as called for in claim 9 is a matter of normal design procedure. As no particular advantage of a heat sink comprising the grid according to claims 1-4 is defined in the present application, its inclusion in a heat sink would therefore be an obvious design possibility for the skilled person in order to solve a problem (said problem is neither defined in nor derivable from the present application). Consequently, the subject matter of claim 9 is not considered as involving an inventive step (Article 33(3) PCT).

7 Dependent claims 2-4, 6-8, 10, 12,13, and 15 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, in view of the disclosure of D1-D5.

Re Item VII

Certain defects in the international application

1 A hole density on a surface is expressed in number of holes per unit area. The units holes (or dots) per unit length used on p. 4, l. 18 is thus not understood.

2 A rotation speed is expressed in rad / unit time or revolution per unit time (e.g., rpm). When defining a rotation speed in terms of [m / min] as on p. 5, l. 14, it is necessary to define the distance to the centre of rotation of the point which is taken as reference to define the velocity.

3 The present application does not meet the requirements set forth in Rule 5 PCT, in that:

(a) the relevant background art (D1-D5) is not disclosed (Rule 5.1(a)(ii)); and

(b) the technical problem to be solved by the claimed invention is not mentioned and is hardly recognizable from the description (Rule 5.1(a)(iii)).

4 The present application does not meet the requirements set forth in Article 5 PCT for the following reason. The way the prosthetic hip joint according to the invention should be produced is not clear from the description. All the other embodiments of the present application refer to laminar structures supporting little or no loads: the grid is exfoliated from the matrix material and used alternatively as filter or heat sink. On the other hand, the peg of a prosthetic hip joint is a bulky material which requires high mechanical strength to resist the heavy loads imparted by a body in movement. It is not clear whether the grid called for in claim 1-4 is fixed by some external means to a core peg (e.g., adhesive, mechanical fastening), or whether the core peg forms the cathode during electro-deposition. In the latter case, it is not clear how the dielectric resin filling the ink pots is removed therefrom.

Re Item VIII

Certain observations on the international application

1.1 The expression "for example" has no limiting effect on the scope of a claim. Consequently, the feature "[holes] sufficiently large to permit the passage of plasma" is not considered as limiting the scope of claim 5.

1.2 The relationship in claim 5 between the passage of a plasma and tissue growth

through a grid structure is not quite clear (Article 6 PCT). The description p. 8, ll. 10-13 is not much clearer.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
P007708WONJN		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/IB00/01419	22/09/2000	22/09/1999
International Patent Classification (IPC) or national classification and IPC B01D39/00		
Applicant VIOSTYLE LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

I	☒	Basis of the report
II	☐	Priority
III	☐	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	☒	Lack of unity of invention
V	☒	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
VI	☐	Certain documents cited
VII	☒	Certain defects in the international application
VIII	☒	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
19/04/2001	10.12.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Connor, M Telephone No. +49 89 2399 8402

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB00/01419

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1-10 as originally filed

Claims, No.:

1-15 as originally filed

Drawings, sheets:

1/2-2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

   ☐ restricted the claims.

   ☐ paid additional fees.

   ☐ paid additional fees under protest.

   ☒ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

   ☐ complied with.

   ☒ not complied with for the following reasons:
   see separate sheet

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

   ☒ all parts.

   ☐ the parts relating to claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-8,11-15
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-15

Industrial applicability (IA) Yes: Claims 1-15
No: Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Re Item IV

Lack of unity of invention

1 As explained in point V-2&3 (below), the subject matter of claims 1 and 14 is not considered to be new in view of the prior art (Article 33(2) PCT). Consequently, there is no inventive concept linking the subject matter of claims 5, 9, and 11 (Rule 13 PCT).

The applicant is asked to state upon which invention further prosecution of this application should be based and to limit the application accordingly. Other inventions are to be excised from the claims, description and drawings.

Re Item V

Reasoned statement under Rule Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 The following documents are referred to in the present opinion:

D1: PATENT ABSTRACTS OF JAPAN vol. 4, no. 151, 23 October 1980 (1980-10-23) & JP 55 097220 A (DAINIPPON PRINTING CO), 24 July 1980 (1980-07-24)
D2: US-A-4 118 288 (S.RÜCKL) 3 October 1978 (1978-10-03)
D3: US-A-4 839 001 (J.J.BAKEWELL) 13 June 1989 (1989-06-13)
D4: EP-A-0 621 018 (KYOCERA CORP.) 26 October 1994 (1994-10-26)
D5: GB-A-1 215 864 (BUCKBEE-MEARS COMP.) 16 December 1970 (1970-12-16)

2 The method of producing a laminar structure proposed in claim 14 of the present application cannot be considered as being novel (Article 33(2) PCT) for the following reasons. D5 discloses the same method as the one called for in claim 1 of the present application (cf. in particular Figures 1 and 3).

3 The laminar structure proposed in claim 1 of the present application cannot be considered as being neither novel nor inventive (Article 33(2)&(3) PCT) for the following reasons.

3.1 D1-D3 disclose a laminar structure comprising a deposited metal with through-holes. It can be seen in Figure 11 of D2, that the edge of the holes of the metal grid #23 is slightly rounded. Said structure is considered to be common to the grids of all of D1-D3 since the grids disclosed therein are all obtained by the same type of process:

viz., galvanic deposition onto a metallic surface comprising a coated layer of a photosensitive material forming a dotted pattern.

3.2 D5 discloses a method of forming laminar structures falling within the scope of claim 14 of the present application (cf. point V-2 supra). Since the method called for in claim 14 has necessarily as its end result the product called for in claim 1 of the present application (Article 6 and Rule 13 PCT), the grid obtained with the process disclosed in D5 necessarily falls within the ambit of claim 1 of the present application.

4 The filter element proposed in claim 11 of the present application cannot be considered as being neither novel nor inventive (Article 33(2)&(3) PCT) because D1 discloses a similar filter.

5 The medical device proposed in claim 5 of the present application cannot be considered as being inventive (Article 33(3) PCT) because D4 discloses medical devices comprising a metal structure having micro holes formed therein. The skilled person would only have to chose between one of the grids available in the market (e.g., as disclosed in D1-D3 or D5) to reach the subject matter of claim 5 of the present application, without involving any inventive activity.

6 The search report does not comprise any document disclosing a heat sink. It is the opinion of the substantive examiner, however, that a heat sink comprising a grid structure as called for in claim 9 is a matter of normal design procedure. As no particular advantage of a heat sink comprising the grid according to claims 1-4 is defined in the present application, its inclusion in a heat sink would therefore be an obvious design possibility for the skilled person in order to solve a problem (said problem is neither defined in nor derivable from the present application). Consequently, the subject matter of claim 9 is not considered as involving an inventive step (Article 33(3) PCT).

7 Dependent claims 2-4, 6-8, 10, 12,13, and 15 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, in view of the disclosure of D1-D5.

Re Item VII

Certain defects in the international application

1 A hole density on a surface is expressed in number of holes per unit area. The units holes (or dots) per unit length used on p. 4, l. 18 is thus not understood.

2 A rotation speed is expressed in rad / unit time or revolution per unit time (e.g., rpm). When defining a rotation speed in terms of [m / min] as on p. 5, l. 14, it is necessary to define the distance to the centre of rotation of the point which is taken as reference to define the velocity.

3 The present application does not meet the requirements set forth in Rule 5 PCT, in that:

(a) the relevant background art (D1-D5) is not disclosed (Rule 5.1(a)(ii)); and

(b) the technical problem to be solved by the claimed invention is not mentioned and is hardly recognizable from the description (Rule 5.1(a)(iii)).

4 The present application does not meet the requirements set forth in Article 5 PCT for the following reason. The way the prosthetic hip joint according to the invention should be produced is not clear from the description. All the other embodiments of the present application refer to laminar structures supporting little or no loads: the grid is exfoliated from the matrix material and used alternatively as filter or heat sink. On the other hand, the peg of a prosthetic hip joint is a bulky material which requires high mechanical strength to resist the heavy loads imparted by a body in movement. It is not clear whether the grid called for in claim 1-4 is fixed by some external means to a core peg (e.g., adhesive, mechanical fastening), or whether the core peg forms the cathode during electro-deposition. In the latter case, it is not clear how the dielectric resin filling the ink pots is removed therefrom.

Re Item VIII

Certain observations on the international application

1.1 The expression "for example" has no limiting effect on the scope of a claim. Consequently, the feature "[holes] sufficiently large to permit the passage of plasma" is not considered as limiting the scope of claim 5.

1.2 The relationship in claim 5 between the passage of a plasma and tissue growth

through a grid structure is not quite clear (Article 6 PCT). The description p. 8, ll. 10-13 is not much clearer.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
P/7708.WONJN		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/IB 00/01419	22/09/2000	22/09/1999
Applicant		
VIOSTYLE LIMITED et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

[ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

[ ] contained in the international application in written form.

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[ ] furnished subsequently to this Authority in written form.

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[ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

[ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

[X] the text is approved as submitted by the applicant.

[ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**

[X] the text is approved as submitted by the applicant.

[ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 3

[ ] as suggested by the applicant.

[ ] None of the figures.

[ ] because the applicant failed to suggest a figure.

[X] because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

International Application No
PCT 00/01419

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B01D39/20 C25D1/08 C25D1/20 A61F2/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B01D C25D A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 4, no. 151, 23 October 1980 (1980-10-23) & JP 55 097220 A (DAINIPPON PRINTING CO), 24 July 1980 (1980-07-24) abstract	1-4,11, 13,14
X	US 4 118 288 A (S.RÜCKL) 3 October 1978 (1978-10-03) the whole document	1-4
A	US 4 839 001 A (J.J.BAKEWELL) 13 June 1989 (1989-06-13) the whole document	1,12,15
A	EP 0 621 018 A (KYOCERA CORP.) 26 October 1994 (1994-10-26) claims 1,4; figures 1-4	1,5-8

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 April 2001	18/04/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bertram, H

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/00/01419

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 1 215 864 A (BUCKBEE-MEARS COMP.) 16 December 1970 (1970-12-16) the whole document	1
A	US 4 552 832 A (F.BLUME ET AL.) 12 November 1985 (1985-11-12) claim 1; figures 1,8	1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/ 00/01419

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
JP 55097220	A	24-07-1980	JP	1439716 C	19-05-1988
			JP	62049094 B	16-10-1987
US 4118288	A	03-10-1978	AT	358072 B	25-08-1980
			AT	228376 A	15-01-1980
			AU	501755 B	28-06-1979
			AU	2371277 A	05-10-1978
			BE	852744 A	18-07-1977
			CA	1104869 A	14-07-1981
			CH	627794 A	29-01-1982
			CS	190343 B	31-05-1979
			DD	130013 A	01-03-1978
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			US	5732469 A	31-03-1998
			DE	69328047 D	20-04-2000
			DE	69328047 T	13-07-2000
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			NL	6816324 A,B	29-09-1969
US 4552832	A	12-11-1985	DE	3208081 A	08-09-1983
			AT	22710 T	15-10-1986
			DE	3366717 D	13-11-1986
			EP	0088476 A	14-09-1983
			JP	1396218 C	24-08-1987
			JP	58157985 A	20-09-1983
			JP	62005235 B	03-02-1987

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
P/7708.WONJN		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/IB 00/01419	22/09/2000	22/09/1999
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Date of the actual completion of the international search	Date of mailing of the international search report
5 April 2001	18/04/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bertram, H

1

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/I[redacted]0/01419

C.(Continuation) DOCUMENTS CONSIDERED TO [redacted] RELEVANT

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INTERNATIONAL SEARCH REPORT

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International Application No
PCT/I[redacted]0/01419

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		CA 1104869 A	14-07-1981
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		CS 190343 B	31-05-1979
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		GR 62570 A	10-05-1979
		HU 176024 B	28-11-1980
		IL 51693 A	30-12-1979
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		SE 7703116 A	30-09-1977
		SU 657768 A	15-04-1979
		YU 79877 A	21-01-1983
		ZA 7701655 A	22-02-1978
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		EP 0566427 A	20-10-1993
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		AT 22710 T	15-10-1986
		DE 3366717 D	13-11-1986
		EP 0088476 A	14-09-1983
		JP 1396218 C	24-08-1987
		JP 58157985 A	20-09-1983
		JP 62005235 B	03-02-1987

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 93305669.9

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	US - A - 4 570 271 (SUMP) * Totality; especially abstract and claims 1,2; figs. 1,2 *	1,2,6, 8,9	A 61 F 2/28 A 61 F 2/32
Y	US - A - 5 112 354 (SIRES) * Abstract; figs. 1,2 *	1,2,6, 8,9	
A	EP - A - 0 289 922 (KRUPP) * Claims 1,5,6,7; figs. 1,2 *	1,2,8, 9	
A	DE - A - 3 639 030 (KAWAHARA) * Totality; especially claims 1-5,13; figs. 1-4 *	1,2	
A	US - A - 5 108 435 (GUSTAVSON ET AL.) * Claims 1-7; figs. 1-9 *	1,2	TECHNICAL FIELDS SEARCHED (Int. Cl.5) A 61 F A 61 L A 61 K B 22 F C 23 C A 61 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	05-05-1994	MIHATSEK

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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